

# **My Achievement and Future on My Hometown Minamisoma City Affected Fukushima NPP Accident to Cooperate with the Local Core for Reconstruction and Decrease Dose Rate in the Rice Fields**

A Native of Minamisoma, **Osamu Amano**

The majority of Minamisoma City in Hamadori (an area located along the Pacific coast), Fukushima Prefecture, was not designated as an evacuation zone. With the exception of the younger generations, most residents have remained there with the aim of cleaning up and restoring their home communities. In this sense, Minamisoma City stands at the forefront of Japan's restoration efforts. However, the cleanup and restoration work would be precarious if the community members depended totally on the national, prefectural, and city governments. The author has sought to encourage local communities to take whatever action was feasible while discussing with them the most effective way of doing so. By making regular visits to Minamisoma City, where he has many relatives, the author has supported the local communities in collaboration with volunteers from Tokyo and local community members.

With his father and many other relatives still living there, the author visited his hometown for the abovementioned purpose in May 2011. Until September that year, efforts had been made to secure a partnership with the governments of the city of Minamisoma and the village of Iitate. Due to their slow response, a partnership was gradually established with JA Soma (an agricultural cooperative), the Minamisoma Decontamination Association (formed by youth volunteers from the Haramachi Chamber of Commerce), the Ota District Reconstruction Council, and the district leader of Jisabara.

The area relies mainly on agriculture, so soil plays an essential role there. The radioactivity concentration (Bq/kg) must be measured to assess the level of contamination and the extent of decontamination that is required. Since 2012, the author has been working with stakeholders and core members of the local communities to organize simplified measurements so that local residents can be updated on the radioactivity concentration in the soil. Ordinary radiation detectors ( $\mu\text{Sv/h}$ ) were provided free of charge at a soil measurement station run by the author's father, while lecture presentations, soil measurement days, and so forth were also held. Sunflowers, which hold promise as an effective means of decontamination, are about to bloom. In relation to this, the author also intends to work with supportive organizations to convey the views of Minamisoma residents to the Tokyo Electric Power Company, the city, prefectural, and national governments, as well as attentive observers from the rest of the world.

## **I. Leaving the Restorative Work, Cleanup Initiatives, and Lifting of Evacuation Orders to Local Residents**

Located along the warm Pacific coast of Fukushima, Hamadori has an idyllic climate. The people who live in this countryside area tend to be laid back and they seldom take action proactively. Nonetheless, the local wild horse chasing festival that is held every July serves as a reminder of the samurai horse riding training of days gone by. The samurai spirit lives on to this day.

If it retains a victim mentality, Hamadori will be left behind and suffer further ruin. Younger parents with children have already evacuated and they rarely return to visit the elderly who have stayed behind. As a result, families are disintegrating on a large scale.

Since his first visit to communities beyond the evacuation zones, the author has been yearning to encourage local initiatives to restore, clean up, and even further develop their own communities. The author also hopes to apply best practices wherever feasible in the current evacuation zones as a point of reference for the restoration and further building of their communities.

## **II. Motivating and Enabling Community Members Through Collaborative Efforts**

Administrative staff lacking the necessary expertise or experts from outside the area would only draw resentment from local residents if they tried to reassure them of their safety. In particular, such an attempt would only prove counterproductive with the parents of children. However, since his father and relatives live there, the author is treated as a native expert from Minamisoma as an insider in each area. This local connection enables the author to provide local residents and administrations with a comprehensive explanation of the likely impact of radiation and realistic countermeasures without provoking a negative response. They even ask the author questions in order to consider the necessary measures together. His explanations have covered the causes of the Fukushima Nuclear Accident, the released radioactivity, the contamination and deposition mechanisms, and the decontamination and cleanup methods as well as descriptions of how radioactivity migrates to farm crops and how this migration can be restrained. The author briefed people residing in the Ota district of Minamisoma (where Ota Shrine holds the wild horse chasing festival) and the Tamano district of Soma (next to Ryozen). After that, the author and local residents conducted radioactivity measurements in their paddies and fields, scraped off the topsoil, and examined the effectiveness of deep ploughing to flip the top 30-cm layer of soil upside down (this approach involved a combination of lecture presentations, demonstrations, and joint measurements).

Gamma rays come from all directions 100 m away and they can affect measurements from 20 m away. Therefore, measurements must be conducted in a shielded environment in order to examine the effects of partial decontamination initiatives (e.g., deep ploughing of a 3 m square plot).

When the author and some local residents from the Baba district (closer to Namie) and the Ota district of Minamisoma organized demonstrations and measurements last August (2011), the author with a help of a few local partners covered the radiation detector with several blocks of lead. The detector and the shield had to be brought into the paddies before and after the deep ploughing. Unfortunately, these heavy blocks had to be carried one at a time. They

are very unwieldy, especially given the poor footing in paddies. To resolve this issue, the author devised a cylindrical shielded container that can accommodate most types of commercially available radiation detectors and plastic storage containers for soil measurements. The author consulted Mr. Eiji Tadano from the Haramachi Chamber of Commerce about the idea of producing these cylindrical shielded containers locally, but the latter could not come up with any suitable local candidates. Consequently, the manufacturing work was requested of an ironworks in Osaka that Mr. Tadano knew. Made of lead, the manufactured cylindrical shielded container could be moved around easily thanks to its external stainless steel carry handle. Several containers were ordered and received by stakeholders, thereby enabling them to conduct shielded measurements on site.

Today, cheaper containers are produced using scrap lead from a factory in the Ota district of Minamisoma that is operated by Mr. Teruo Ara, with whom the author works together as mentioned later. These containers are employed by JA Soma, Iitate, Tomioka, and many other places.

On-site demonstrations employ shovels, compact excavators, and other large machinery borrowed from local residents. This machinery is used to scrape off the topsoil or perform deep ploughing before the radiation dose of the soil is measured directly underneath a radiation detector protected inside a shielded container. Local residents are convinced when they see the radiation dose reduced to one-third, one-tenth or some other fraction of the initial level.

Unfortunately, a realistic approach such as this was not taken in the immediate aftermath of the accident that occurred in 2011. Initially, deep ploughing was not commonly practiced in highly contaminated areas due to the majority being in favor of scraping off the topsoil and taking it away to treatment facilities. However, the construction of these treatment facilities became difficult because many communities were reluctant to host them. A while later, a decontamination manual published by the Japanese Ministry of the Environment and another manual issued by the Fukushima prefectural government featured this practical approach demonstrated by the author as an option for decontamination.

In furtherance of these decontamination activities, the author would like to present a future plan that employs work logs based on his experience. Currently, the author is proposing that residents in contaminated areas request compensation from the national government and the utility company for the costs incurred in the conducting of deep ploughing, soil dressing, sunflower planting, and other types of work that they carry out themselves. Each resident can keep a work log to record the amount of labor, heavy machinery, and other forms of input that they require to carry out their work. These logs, which are examined and sealed by the leaders of the respective districts, can serve as the basis for requesting payments from the national government and the utility company. Under the work log system advocated by the author, local farmers can decontaminate their own farmland and even receive payments for the work. Farmers with ploughs and other heavy machinery can perform deep ploughing for other community members and then request reimbursement. In this way, the whole community can work together to decontaminate their farmland.

### **III. Mingling with People from the Jisabara District in Minamisoma and Iitate Who Were Introduced Through Relatives**

#### **1. Jisabara district, Minamisoma**

Located in the mountains, Yagisawa Pass can be reached from Minamisoma via Prefectural Highway 12. Auntie Y, a maternal relative of the author, lives in the Jisabara district, where the trail to the pass begins. Traveling from Minamisoma, visitors can reach Iitate by passing through Yagisawa Pass. The Jisabara district borders Iitate. The current external dose rate (as of May 2012) measures somewhere in the range of 1.0 to 1.5  $\mu\text{Sv/h}$ . Last November, the author held a lecture presentation on the level of contamination in the district and potential decontamination methods. Thanks to generous support from JA Soma and the district leader, almost all of the district's residents gathered at the local meeting hall. The presentation gained their understanding. Later, two volunteers from Tokyo were invited to the home of Auntie Y to conduct an investigation on decontamination using deep ploughing, soil dressing, controlled burning, and the removal of garden shrubs. These two volunteers were Dr. Tetsuo Sawada (Assistant Professor at the Research Laboratory for Nuclear Reactors (present name: Laboratory for Advanced Nuclear Energy), Tokyo Institute of Technology) and Ms. Atsuko Kuroiwa (working for Mitsubishi Heavy Industries and a leading member of WIN-JAPAN).

The positively charged radioactive cesium that was produced in the accident adhered to soil, roofs, walls, and roads as well as to the trunks, branches, and leaves of trees. Radioactive cesium cannot be removed easily because its electric adsorption is firm and stable. However, its removal is possible as long as the media of adsorption can be moved somewhere else by, for example, scraping off the topsoil and cutting away trees and shrubs. Following the explanation that the author provided last November, the leader and local residents of the Jisabara district opted for the scientific and rational options. They decided where they should locate a temporary storage yard in their district. Due to the arrangements made by the city government of Minamisoma, the decontamination of houses and yards in that area is about to begin.

The city of Minamisoma canceled rice planting in all of its paddies in 2012 and it then plans to resume the planting in 2013. The author has been conducting a project involving the planting of sunflowers to decontaminate paddies and fields throughout the entire Jisabara district and other areas with highly contaminated soil. (The decontamination work is performed by removing the sunflower roots and stems after the plants have absorbed the radioactive cesium from the soil.) Local residents have planted sunflowers in paddies and fields with a total area of about 6 ha (totally 60 paddies and fields). The necessary seeds were provided by the Agriculture, Fisheries, and Forestry Department of the city government of Minamisoma. In a similar project conducted by the national government in 2011, the sunflower roots failed to remove radioactive substances that were still deposited on the soil surface. In 2012, however, over 300 farmers involved in the author's sunflower project will be requested to perform deep ploughing or other such operations to move the radioactive substances deeper underground before they begin sowing seeds from mid-May in an attempt to ensure that the radioactive substances are absorbed by the roots of the plants. These farmers represent not only the Jisabara district, but also other partner communities in the Ota district and Tamano in Soma.

Some have voiced the opinion that deep ploughing only disperses the contaminants. Nonetheless, in moderately contaminated areas, the soil contamination can be reduced from somewhere between 10,000 Bq/kg and 20,000 Bq/kg to 5,000 Bq/kg, a level that enables crops to be grown. At the same time, this process facilitates a reduction in the external dose rate.

Consequently, the dose rate among earthworms on the surface soil also drops, which translates into a reduced dose rate among wild birds and the small animals that feed on them. Deep ploughing is a realistic and scientifically sensible method for restoring a sound food chain. Extensive decontamination can be expected if sunflowers are planted to remove radioactive substances. Once the sunflower plants grow, their roots, stems, and flowers will be sampled to assess their effectiveness in removing radioactive substances.

Unfortunately, some paddies and fields have a soil depth of around 10 cm, which is not enough to allow topsoil scraping or deep ploughing. Auntie Y also has the same problem. The shallow soil lies on a hard gravel layer that cannot be upturned with a shovel. A large amount of soil would need to be transported from elsewhere to facilitate the necessary dressing (i.e., covering with uncontaminated soil), as explained in the manual published by the Ministry of the Environment. Test surveys are still underway in some areas, and these will need to be completed before a full-fledged decontamination operation can start. If the decontamination by sunflower planting is not effective, the remaining countermeasure for shallow paddies and fields is soil covering.

## **2. Iitate**

Auntie K, another maternal relative of the author, has been supporting Mayor Norio Kanno of Iitate Village. Soon after the Fukushima Nuclear Accident, residents of one district after another evacuated the village due to the high dose rate that was observed despite its considerable distance from the accident site. Auntie K was separated from her family when she was evacuated to a temporary shelter in Matsukawa, Fukushima. In November 2011, the author worked with JA Soma to brief evacuees at the temporary shelter in Matsukawa on contamination situation and realistic cleanup methods. Personnel from the village office, local assembly members, and the mayor's wife participated in the briefing and tried to initiate a decontamination process that would involve using deep ploughing and other methods. However, since villagers failed to reach an agreement and they were separated from their village, the author has failed to coordinate with them for any further action.

## **IV. The Bewildered Governments of Minamisoma and Iitate**

On May 19 last year (2011), the author visited the mayor of Minamisoma to accompany Professor Satoru Tanaka, president of the Atomic Energy Society of Japan, and Dr. Tadashi Inoue, chairperson of the Cleanup Subcommittee. Every month from that June to September, the author visited the mayor and other senior city officials. Once, the author conducted a briefing for local residents in the gymnastic hall of an elementary school thanks to arrangements made by the city government.

The city mayor, Mr. Katsunobu Sakurai, is a friendly and smart person. The author has been briefing the mayor and senior officials of the city government on the nuclear accident and realistic measures. They understand the situation, but the government cannot take action alone. Decontamination work requires the right personnel. The downside of the area's mild climate and laid-back culture is the limited availability of people who can implement transitional measures under abnormal conditions during an emergency. A decontamination measures office was established, but it is hard to imagine this office leading motivated city residents in a local decontamination initiative to restore the city with budgetary support from the

national government, which is the author's hope. Despite the support provided earlier, the Minamisoma Decontamination Association has no realistic plans or executive capacity. They are unable to take coordinated action with the city government.

Until the accident that occurred on March 11, 2011, the village of Iitate had been trying to embody a "*madei* lifestyle," which is faithful to a local idiom that means devoting a great deal of care for people, under the leadership of Mayor Kanno. The community worked hard to cultivate healthy soil, and their farm products were shipped to the Greater Tokyo Area and even the Greater Osaka Area to provide a considerable income for the village. Each farmer has borrowed more than 50 million yen to purchase the farming equipment necessary to cultivate excellent soil. They will be left with huge debts if their products cannot be sold. The municipal government must take scientifically sensible measures while also taking into consideration these debts. At present, the village has divided opinions.

## **V. Partnerships with Core Community Members of Minamisoma and Other Concerned Municipalities, JA Soma, the Minamisoma Decontamination Association, and People from the Ota District**

The author visited Minamisoma every month from May to December 2011 as well as in March and June 2012. With each trip lasting about three days, he regularly visited places such as JA Soma and the Ota and Jisabara districts.

### **1. JA Soma**

The urban part of Minamisoma mainly consists of residential lots. However, farmland and forests can be found not far from the city center. Indeed, agriculture—particularly rice cultivation—is the key industry for Hamadori.

Serving Shinchi Village, Soma City, Minamisoma City, and Iitate Village as an agricultural cooperative, JA Soma is led by a charismatic president called Yoshishige Suzuki. The deputy director of the Rice and Grain Department, Mr. Yoichi Kikuchi, was kind enough to liaise with JA Soma and the leaders of the Jisabara district and Iitate and he helped the author to hold briefing sessions. He even photocopied and distributed the necessary handouts.

Mr. Suzuki repeatedly stressed the fact that their communities would fall apart if the farmers quit growing rice after receiving compensation payments. Motivated by the awareness shown by Mr. Suzuki, the author has been conducting lecture presentations, decontamination demonstrations, and measurements in an easy-to-understand manner. Senior staff from JA Soma met in a large meeting room to improve their knowledge and techniques. As a result, JA Soma became able to take scientifically sensible measurement, such as performing comprehensive rice inspections of the rice they ship with two NaI gamma-ray spectrometers they introduced.

In Minamisoma, the mayor, JA Soma, and other stakeholders agreed to give up cropping in 2012 in preparation for the full-fledged resumption of rice production beyond 2013. The goal is to grow rice throughout the entire area while limiting the radiation from rice to no more than 100 Bq/kg in accordance with the threshold set by the national government. To this end, Minamisoma will conduct cropping test in 2012 by doing decontamination in 200 paddies,

including those with a high dose (Agriculture and Fisheries Department, Minamisoma City).

Decontamination is conducted using the following four methods.

- (1) Topsoil scraping
- (2) Ploughing
- (3) Deep ploughing
- (4) Application of zeolite and potassium in shallow paddies

Surveys consist of the following elements.

- (1) Measurement of the radioactivity concentration in soil before decontamination work
- (2) Measurement of the radioactivity concentration in soil after decontamination work as well as the radioactivity concentration of harvested brown rice

Full-fledged rice planting is planned for the next year based on the outcome of the surveys. One of the targets is to reduce the radiation level of soil to below 5,000 Bq/kg.

## 2. Minamisoma Decontamination Association

It is essential for measurements to be taken before and after the decontamination work. Indeed, proper decontamination is impossible unless the radiation levels are measured. Based on the knowledge and experiences as a licensed Category-1 Radiation Protection Supervisor, the author repeatedly conducted measurement workshops in his home region in October and December 2011 as well as in March and June 2012.

In order to achieve restoring, clean-up and lifting of evacuation order for the local area, youth volunteers from the Haramachi Chamber of Commerce, an organization that mobilizes the local industries and businesses of Minamisoma, were asked to offer their help in mobilizing the local industries and businesses of Minamisoma in efforts to organize lecture presentations, demonstrations, and measurement workshops. The taking of measurements requires practice and this skill cannot be mastered instantly in workshops alone. Unfortunately, the youth volunteers did not continue practicing. They set up the Minamisoma Decontamination Association, which was licensed by the prefectural governor of Fukushima. However, the association is not functional or competent enough to support any initiatives.

In a related matter, the second and subsequent measurement workshops were conducted in a large meeting room at the JA Soma head office so that personnel from the head office and four farming centers that serve five different areas, including Iitate (where people have been evacuated), could attend. The author helped participants to repeat the exercise of drawing calibration lines for soil measurements (correlation between Bq/kg and  $\mu\text{Sv/h}$ ) before measuring the radiation level of the sample soil that they brought with them. Personnel from these farming centers can now conduct soil measurements by themselves.

## 3. Ota District

Situated in the south of Minamisoma, the Ota district hosts the wild horse chasing festival at Ota Shrine. The people there exhibit a strong team spirit, just like the samurai of the olden days. The leaders of some districts and Mr. Kenro Okumura, a city council member from the Ota district, have set up the Ota District Reconstruction Council. Chaired by Mr. Kisao Watanabe, it is tasked with restoring the community from the damage inflicted by the tsunami and radioactive contamination. The author visited the district a few times to give lectures followed by demonstrations and joint performances of deep ploughing (i.e., flipping a 30-cm layer of soil upside down using a compact excavator), the removal of highly contaminated gravel, and soil dressing to shield the radiation at actual farmland and residential plots.

A closer partnership is being forged with volunteer musicians from a band called Rose in many Colors from Tokyo, who participated in the cultural festival held at the gymnastic hall of a junior high school in the Ota district last autumn (November 5, 2011). This March, an exchange session on initiatives for the Ota district was held by members of the Ota District Reconstruction Council and supporters of Tomioka. The team spirit demonstrated by the district should serve as a reference for Tomioka, Naraha, and Kawauchi.

## **VI. Approach to Affected Communities**

The author would like to request that stakeholders in the nuclear sector remain mindful of the approach to affected communities.

Generally speaking, Americans tend to be more willing than Japanese to commit themselves to implementing initiatives.

The Fukushima Nuclear Accident directly involved the Tokyo Electric Power Company (TEPCO) and the national government (Nuclear and Industrial Safety Agency). However, anyone directly or indirectly involved in the nuclear power sector should be considered stakeholders in the accident. The author thinks that they should engage with the affected communities proactively with a sense of ownership. Unfortunately, the majority of people seem to stay on the sidelines.

People's failures sometimes cause problems for others. A person's qualities are demonstrated by how they react after causing a problem. The failure in Fukushima caused core meltdowns for just the third time in the world. The subsequent massive release of radioactive substances seriously affected many communities, and even caused family breakdowns. Such a blunder could perhaps be described as a devastating defeat in a war. The stakeholders must share the pain of the affected communities and engage in decontamination work as well as cleanup and restorative efforts with a sense of ownership. That is our responsibility. The stakeholders should visit the affected communities in person to support them. In discussions concerning the future use of nuclear energy, the actions that the national government, TEPCO, and other stakeholders have taken to help the victims will be called into question.

## **VII. Goals and Future Challenges in Relation to Providing Assistance From the Second Year Onward**

The Japanese Ministry of Education, Culture, Sports, Science and Technology has conducted monitoring surveys alongside roads by using vehicle-mounted detectors. The measurements demonstrated a 30% drop in the external dose rate over the course of half a year. Of this drop, 17% can be accounted for by physical decay given that cesium-134 has a half-life of two years. The remaining 13% can be attributed to the self-cleansing effect of nature. This pace is five times faster than the global average. The topsoil there is carried away to rivers that almost resemble waterfalls in comparison to the much slower flows of the Danube and other rivers in Europe. After it reaches the sea bottom, the soil is further carried away into the vast ocean by swelling waves during typhoons or the like.

Spurred on by this natural reduction process, the author will collaborate with local residents to regularly monitor the soil in the affected communities and try to reduce the radiation



level to 5,000 Bq/kg or less as a threshold for planting rice. Depending on the transfer factors for the intended vegetables and other crops, the radiation level of the soil needs to be further reduced or farmers will need to limit their choice of crops. The author and other stakeholders must communicate such information to the affected communities. The author is facilitating the establishment of privately owned simplified measurement stations (relative measurements taken using a standard sample identified with a germanium-based semiconductor detector) to supplement the public measurement stations (NaI gamma-ray spectrometers) prepared by the city government of Minamisoma.

More specifically the extent of soil contamination and the necessary decontamination efforts need to be assessed based on measurements of the radioactivity concentration in the soil (Bq/kg). Three systems for measuring the radioactivity concentration with ordinary detectors ( $\mu\text{Sv/h}$ ) were deployed at the homes of the author's father and two other relatives. Mr. Teruo Ara has installed another one himself in the Ota district. The author facilitates the taking of local measurements by preparing standard samples, publishing measurement instruction manuals, and conducting hands-on exercises. The measurement station that is run by the author's father free of charge was asked to measure soil from the paddies and fields of over 150 neighbors and other acquainted farmers. In addition to these measurements, the father also provides consultations for people who bring in highly contaminated soil. For instance, he recommends deep ploughing and provides advice on which vegetables can still be grown. The author receives the measurement results from his father via emails so that they can discuss together how the radiation level can be reduced. The father then passes along the advice personally to the owners of the relevant sample.

On June 2, volunteers of the Japanese Red Cross from Kashima, Minamisoma (led by Ms. Hideko Takano) held a lecture presentation on how radiation will affect local life along with an event at which the radioactivity of soil brought in by participants was measured. During the author's lecture presentation that was conducted at the community center in Minamisoma, Mr. Teruo Ara was joined by the author's father and relatives in measuring the radioactivity concentration of 70 soil samples brought in by 120 local women. The measurement results, which were obtained using a simplified system, were indicated on each bag. Most of the owners were relieved to find that the radiation levels were lower than they had expected. They were encouraged to grow summer vegetables and convinced that local products are safe to eat. Soil measurements will be continued by the author from the second year onward to provide people in Minamisoma and Soma with the necessary information and assistance.

## **VIII. Sharing the Experiences and Views of the Affected Communities with the Rest of the World**

The world is carefully watching how communities affected by the Fukushima Nuclear Accident can be saved. The reason for this global attention is that Hamadori is a victim of the use of nuclear energy by humankind. The author is seeking to work closely with the affected communities to discuss what can be done and share our experiences with the rest of the world.

The Jisabara district in Minamisoma, the neighboring Ohara district, and Tamano in Soma (located further to the north) have all been contaminated, but the people living there have not been evacuated. The Jisabara district managed to designate a site for the temporary storage of soil from the district. The decontamination work is due to start with residential plots and

houses. The decontamination of farmland is expected much later.

These communities are the victims of the use of nuclear power, and the world is keeping a curious eye on the way Japan handles this challenge. How do the residents of Minamisoma perceive the damage that they sustained in their respective communities (past)? What should be prioritized and what are their needs (present)? How do the communities and residents envision their future in ten to twenty years (future)? The author will work with local community members to share their thoughts with the government of Japan, the prefectural government of Fukushima, the city government of Minamisoma, and TEPCO as well as other concerned parties around the world.

The author will work with residents of the affected communities to grow sunflowers that will fully bloom from mid-July to early August. Every year, the author intends to conduct individual interviews with community members to record their feelings and thoughts, which he will then present in front of the sunflowers in full bloom. The author hopes that this message will reach TEPCO, the government of Minamisoma City, Fukushima Prefecture, and the people of Japan. To gain global support for our initiatives, the author also intends to translate this message into English so that it can be shared with the rest of the world at events such as the international conference to be held in Hiroshima this August by doctors around the world for the prevention of nuclear war.